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ABSTRACT

Three responsibilities of educators with regard to metric instruction are outlined--providing metric awareness, providing inservice education, and providing materials for metric instruction--and a description is provided of a system for classifying instructional materials in a school library so they become more readily available to teachers. The Annehurst Curriculum Classification System, designed for classifying, organizing, storing, and retrieving curriculum materials, is presented in detail. The system involves making 16 decisions about each piece of curriculum material and labeling each item according to those 16 decisions.
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Michael C. Hynes

Metrication and the Public School's Responsibility

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TO THE EDUCATIONAL RESOURCES
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The ever-present "inching" toward the adoption of the metric system as the measurement system for all commerce in the United States is resulting in pressure on public school teachers to teach metric measure. What are the responsibilities of our public schools providing instruction in the metric system? Let's look at three responsibilities that we, as educators, have in this regard:

A. Providing Metric Awareness

Every citizen of the United States must be made aware of the nature of the metric system, the history of the metric system, and the implications of adopting the metric system in this country.

What is the metric system all about? How will we measure length?

- By using a meter stick; a meter is slightly longer than a yard.
- By using a 25 centimeter ruler; a centimeter is about the width of your little fingernail.
- By using a kilometer odometer; a kilometer is about 0.6 of a mile.

How will we measure capacity?

- By using liter bottles; a liter is slightly more than a quart.
- By using milliliters; in cooking 5 mL is about a teaspoon and 250 mL is about a cup.

How will we measure weight?

- By using gram scales; a raisin weighs about one gram -- so does a dollar bill.
- By using kilogram scales; a kilogram weighs about 2.2 pounds.

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How will we measure temperature?

- By the degree Celsius. In the Celsius scale water freezes at 0° and boils at 100°C .

The metric system was invented in France in 1670 by Gabriel Morton, Vicar of St. Paul in Lyons. But, it wasn't until 1790 that a French Commission assigned the name meter to a unit of length. The meter was defined to be one ten-millionth of the distance from the north pole to the equator along the meridian running through Dunkirk, France and Barcelona, Spain. France made this system of measures compulsory in 1840, and many other European countries followed suit.

In the United States, Thomas Jefferson was assigned the task of developing a decimal system of measure when he was Secretary of State. His system was not adopted. In fact, the use of the metric system was not made legal in the United States until 1866.

In 1960, great strides were made in the worldwide acceptance of the metric system. The basic units of measure in the metric system were defined through convenient scientific means and the modernized metric system, *Système Internationale d'Unités* was born.

In 1968 a Metric Study Act was passed in the United States, and after a three-year study it was recommended that the U.S. change to the metric system. In December of 1975 President Ford signed into law "The Metric Conversion Act of 1975". This bill established the U.S. Metric Board to coordinate the voluntary conversion to the metric system.

As a response to this Act, the state of Florida established a Florida Metric Council to deal with metrication in the state. This past December,

the report of this Council was delivered to the governor for action. Look for implications of this report in the 1979 legislative session.

Also as a response to national metric activity a resource center for educational materials was established at the University of Central Florida. We will discuss the role of this Center in more detail later.

B. Providing In-Service Education

The Florida Department of Education, as a part of its metric education plan, has considered all school personnel in its in-service program. A fundamental belief is that effective metric education demands that the students encounter a consistent society; that is, at least a school society which is knowledgeable and supportive of the metric system of measurement. School personnel are divided into three basic groups: support, non-core teachers and core teachers. Each group will have basic knowledge as to why the U.S. is converting to the metric system. As the student contact and responsibility for teaching the metric system to students increases, requirements of school personnel knowledge will increase accordingly.

Support

This group will include all non-teaching (secretarial, custodial, maintenance, etc.) and supervisory personnel. This group will basically be responsible for knowing why the United States is converting to the metric system. Little emphasis will be placed on using the system or knowing the units and basic prefixes.

Non-Core

In addition to knowing the rationalization information necessary for the support group, the non-core people (English, social studies, foreign language,

physical education, etc.) will also need to know basic metric units, prefixes and fundamental measurement techniques and uses. The non-core people will not be directly responsible for teaching the metric information and yet, it is assumed that textbooks will contain metric information, necessitating that those teachers have the metric knowledge necessary to interpret the material consistently and correctly.

Core

These teachers (all elementary, secondary mathematics, secondary science, and all vocational) will be responsible for teaching the metric system. They too will need to be able to rationalize the switch to metric measures. In addition, they will need extensive knowledge of both metric content and methods of teaching that information to their students.

Things to expect in Florida in relation to the State Metric Plan.

Additional emphasis will be given to make metrics a required part of all undergraduate and graduate certification programs, much like the stress which has been given to reading in the content area. Perhaps a similar statement (requirement?) will be issued at the State level.

Emphasis will be given for in-service for community college and university faculty, regardless of the area of expertise.

In response to the needs for metric awareness for all citizens of Florida and in-service for the teachers of children in the state, the Florida Metric Resource Center was established at University of Central Florida (UCF) in Orlando in 1974. The Center is available to all citizens of Florida, as well as non-residents who may express an interest in particular metric data. Groups which have availed themselves of the Center's services include teachers and pre-service teachers who are enrolled at the University, students in classrooms throughout the University service area, local service organizations, teachers of grades K-College throughout Florida and the Southeast, and industries and businesses in the process of converting to the metric system.

All of the metric materials in the Center were donated by their suppliers or manufacturers. A point that is stressed to potential donors is that donated materials are not evaluated by anyone associated with the Center. Thus, if an individual requests the "best" filmstrip on linear measure, a variety of linear filmstrips is sent along with accompanying cassettes, commentaries, work texts, etc. The borrower is encouraged to preview all of the items to determine which one is most effective for the particular purpose. In addition, those who request materials are informed that it is not possible to lend the same items to the same individual on a regular basis. The Center serves as a preview facility, not as a lending library.

Information about the Center and its holdings can be obtained in several ways. A booklet listing the holdings of the Center as of February 1978 has been published. Items received since that time are listed in a regular column in the FCTM Newsletter (Florida Council of Teachers of Mathematics), which is published quarterly and circulates throughout Florida. In addition, the FCTM Newsletter is sent to editors and presidents of state and local mathematics

teacher groups in other parts of the United States and Canada. In the column headed "Metric Resource Center News" items are described and the manufacturer's or publisher's address given.

Lectures, workshops and classroom demonstrations are also given by the directors of the Center and staff of UCF to familiarize even more people with the Center and its activities. These sessions have been offered to local, state and national teacher meetings as well as on a consultant basis throughout the country. One of the most effective means of informing the public about the materials in the Center has been the "grapevine". Many requests for workshops, etc., come from persons who have participated in earlier sessions. Meter sticks with information about the Metric Resource Center printed on one side provide a sort of "business card" when they are distributed.

Requested materials are generally delivered by mail, UPS or bus lines. Occasionally, materials are picked up by the borrower. If delivery is made, the borrower is asked to pay postage and insurance on the items for delivery and return to the Center. This request is made primarily because the Center operates on a zero budget.

The bibliography was published with two grants from UCF's College of Education. All materials are donated, and display space is donated by the College of Education. The time of both directors is totally donated, and has been since the start of the effort. In addition, other projects have been made possible through the donation of materials, staff time, etc., from various sources.

The Center can be especially helpful to various vocational teachers. Many of the materials have direct application to vocational education. Several publications in the collection list vocations which have formalized programs for a metric switch. Ultimately, through the use of the materials provided by the

Center, people can be shown that the metric system of measure is easy and convenient to use, both at home and on the job.

Directors of the Florida Metric Resource Center are Michael C. Hynes and Douglas K. Brumbaugh. Both Hynes and Brumbaugh teach elementary and secondary education classes at University of Central Florida, in addition to the time they donate to the Florida Metric Resource Center.

Basic hours for the Center are 8 to 5, but the directors advise checking with one of them first to be sure the area is staffed when you come. Scheduling is necessarily flexible, since all the staff is voluntary, and donates time as they have it available.

You may contact the Florida Metric Resource Center by writing to this address: College of Education, University of Central Florida, P. O. Box 25000, Orlando, Florida 32816. Phone: (305) 275-2161 (Hynes), or 275-2286 (Brumbaugh).

C. Selecting materials for Metric Instruction

Teachers have always been concerned with why some students learn easily and other don't. As a result, teachers spend considerable time searching through curriculum materials to find those that they believe will be suitable for their students; however, the criteria used by the teachers is not always that which would prove most beneficial to the students. The criteria most teachers use is based upon the physical appearance of the material, organization of the material, correctness of the content and the inclusion of study aids or guides. Although these are important criteria and should be considered when looking for materials, they don't always relate well to the needs of the students.

With the classroom teachers under fire for not producing students who can read, write and do arithmetic, more attention must be paid to the individuality of the learner. In addition, Public Law 94-142 insists that students be placed in an environment which is not restricting to them, and will maximize their potential for learning. Therefore, each student in the classroom must be viewed as an individual and as such should have access to materials which match his skills and abilities, will stimulate him to progress to his potential, will broaden his horizons and most importantly, will help him to be an efficient and effective learner.

How then does the classroom teacher find and select materials for the individual needs of students? At Annehurst Elementary School in Westerville, Ohio, the teachers faced this question head-on. They wanted to set up a program which could help them meet the individual needs of their students, yet fit into the existing school organization and would not necessitate the purchasing of additional and expensive curriculum materials.

They consulted with the faculty at Ohio State University, and determined that if they could classify the materials already in existence at the school, using criteria based upon human characteristics of learners, then maybe they could have such a program. The teachers at Annehurst Elementary School eventually developed a curriculum classification system that classifies materials by subject area, age level, human characteristics of intelligence, experience, social skills, emotional/personality factors and motivation. In addition, teachers can quickly find a variety of material by media format and meet special needs of children who have perceptual motor, visual, auditory, verbal difficulties.

The Annehurst Curriculum Classification System (ACCS)¹ is a way of classifying, organizing, storing and retrieving curriculum materials. As a classification system, ACCS will hold an infinite number of items. A school, or a classroom within a school, may have an ACCS that includes thousands of different items of curriculum materials, each one of which is precisely described in terms of subject matter characteristics and individual learning characteristics. This capacity for thousands of pieces of curriculum material means that the variation in curriculum materials necessary to meet the needs of each individual learner is provided for simply and routinely.

For these materials to be most available to teachers, however, and most useful to student, they must be classified. ACCS classifies curriculum materials in two general ways:

- 1) characteristics of the subject matter
- 2) characteristics of individual learners

Classification of curriculum materials according to the Annehurst Curriculum Classification System involves making sixteen decisions about each piece of curriculum material and labeling each item according to those sixteen decisions. Figure 1 below outlines the sixteen areas in which decisions are made in classifying curriculum materials according to ACCS:

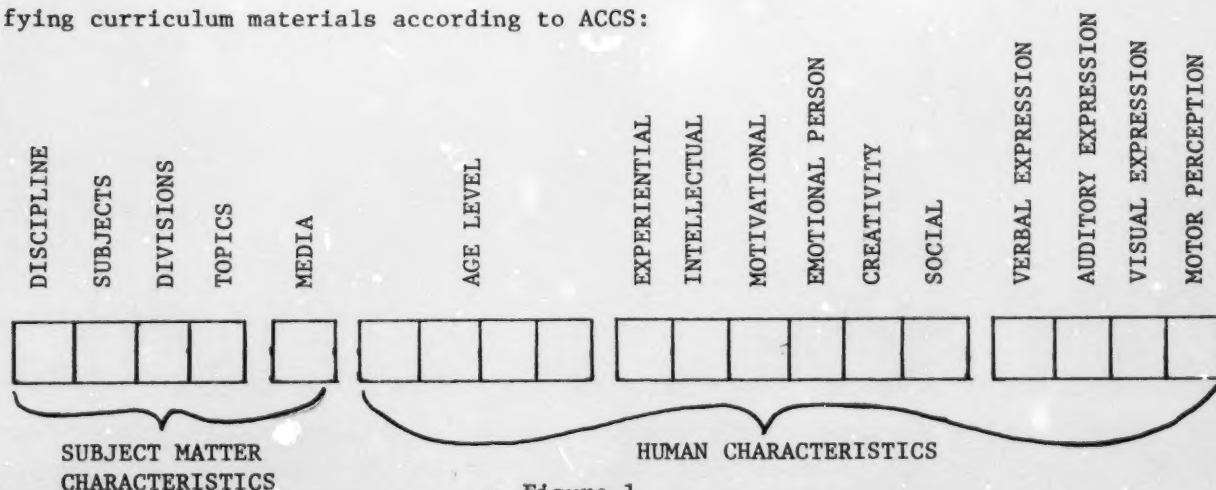


Figure 1

¹Frymier, Jack. Annehurst Curriculum Classification System (West Lafayette, Ind.: Kappa Delta Pi), 1977.

Reading from left to right, the first five areas represent that segment of ACCS in which decisions are made that relate to the subject matter characteristics of the curriculum materials.

The remaining areas represent that segment of AACCS in which decisions are made that relate to the human characteristics of the curriculum material.

Classifying curriculum materials according to human characteristics with AACCS requires the classifier to do three things:

- a. Study the curriculum material carefully;
- b. Study the elaborated continuum of curriculum characteristics carefully and;
- c. Make a general decision that the materials are basically high on that dimension (i.e., the terms in the left hand column generally apply-- see classification form) or that the materials are basically low on that dimension (i.e., the terms in the right hand column generally apply).

In making classification decisions, a few "rules of thumb" have been developed which seem to be helpful:

1. Read the descriptions of curriculum characteristics. Do not operate from memory or from a common sense definition of the factor and do not classify in terms of your interests or preferences.
2. Do not think about students when you classify materials. Think about materials. Study the materials. Read the high/low lists of curriculum characteristics (see attachment). Make a general decision.

3. Use the descriptions of curriculum characteristics in a general way (i.e., with some "slippage"). Do not force a one-to-one correspondence between each piece of curriculum material and every term in the list of characteristics of curriculum materials in either the left or right-hand columns.
4. In some few instances (probably less than 2 percent), none of the terms in either the left or right-hand columns will seem to apply. In those few instances, classify the materials as low or not appropriate, as the case may be.
5. Do not consider how a teacher might use the materials in a classroom unless "directions for use" are included with the materials or printed on them. Classify the curriculum materials as materials, not according to how they might be used.

Use of ACCS

ACCS was created to provide quicker and easier access to all the curriculum resources available to teachers and students. The system alerts the user to commercially produced materials, teacher-made materials, resource people, field trips, and materials other teachers have collected in their personal files. These resources are treated as individual pieces so that the curriculum can become more fluid and thereby more adaptable to individual students. Using the system, teachers can better utilize the most appropriate resources for each child's needs.

The subject matter classification is a hierarchical arrangement consisting of four breakdowns from general disciplines to specific topics.

Level One -- Ten disciplines

Level Two -- Ten major subject areas for each discipline

Level Three -- Ten subject divisions for each major subject area

Level Four -- Ten topics for each subject division

Each resource is coded with the four-digit code for the discipline, major subject area, subject division and topic appropriate to its content. For example, a piece of curriculum material related to associativity would have the ACCS content code 5193. The 5 refers to mathematics, the 1 to addition and subtraction, the 9 to properties, and the 3 to associativity.

Resources may also be coded for their media format and difficulty level (age level). These descriptors are listed below.

MEDIA FORMAT	AGE LEVEL
1. Filmstrips, slides, films, film loops, videotapes.	a. ages 5 - 8
2. Records, audiotapes	b. ages 9 - 12
3. Transparencies	c. ages 13 - 16
4. Worksheets (dittos, etc.)	d. ages 17 - up
5. Books, magazines, pamphlets, tests	
6. Study prints, posters, pictures, maps, charts.	
7. Field trips	
8. Games, flash cards, kits, activity cards, simulations	
9. Globes, models, relia, equipment	
0. People	

ACCS was used to classify the materials housed in the Florida Metric Resource Center. In order to complete the classification, an adjustment to the existing thesaurus was made and is attached to your handout. The results of the analysis of the material in the Florida Metric Resource Center was published in the Winter 1979 issue of the FCTM Newsletter.

In order for you to better understand how the ACCS system can be used to classify materials, we will try to classify some materials.

ATTACHMENTS

1. Area

1. English
2. Metric
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

2. Linear

1. _____
2. English
3. Metric
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

3. Money

1. Value
2. Addition
3. Subtraction
4. Multiplication
5. Division
6. Interest
7. Making Change
8. Cost Calculation
9. _____
0. _____

4. Temperature

1. Celcius/Cent.
2. Farenheit
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

5. Time

1. Calendar
2. Clocks, Tell time
3. Days of Wk, Yr.
4. Months
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

5. Mathematics

5. Measurement

6. Volume

1. English
2. Metric
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

7. Weight

1. English
2. Metric
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

8. Metric

1. Linear
2. Area
3. Volume
4. Capacity
5. Mass
6. Force
7. Temperature
8. Conversion
9. History/Development
0. _____

9. _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

0. _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
0. _____

NAME _____ DATE _____

W O R K S H E E T

FIND THE ANSWERS TO THE FOLLOWING PROBLEMS.

$$\begin{array}{r} 1. \quad 24 \\ \times 10 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 37 \\ \times 21 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 46 \\ \times 19 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 22 \\ \times 22 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 16 \\ \times 30 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 40 \\ \times 50 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 52 \\ \times 39 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 29 \\ \times 45 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 67 \\ \times 47 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 83 \\ \times 79 \\ \hline \end{array}$$

Name of Item _____

DISCIPLINE	SUBJECT AREA	DIVISION	TOPIC	MEDIA	AGE LEVEL

EXPERIENTIAL
 INTELLECTUAL
 MOTIVATION
 EMOTIONAL-PERSONALITY
 CREATIVE
 SOCIAL

HIGH

LOW

APPROPRIATE

DOES NOT APPLY

VERBAL EXPRESSION
 AUDITORY PERCEPTION
 VISUAL PERCEPTION
 MOTOR PERCEPTION

In classifying the piece of curriculum material for age level, the classifier should study the material carefully and consider the interest level, cognitive level, and readability and vocabulary level of the material, then classify it as follows:

- a. 5 through 8 years old;
- b. 9 through 12 years old;
- c. 13 through 16 years old;
- d. 17 and up.

In classifying the piece of curriculum material according to experiential, intellectual, motivation, emotional-personality, creative, and social dimensions, the classifier should study the material carefully, read the list of curriculum characteristics listed under each dimension, and ask the questions:

Which list of terms is most
characteristic of this piece of
curriculum material?

If most of the terms in the left hand column apply, classify the material as "high" on that particular dimension. If most of the terms in the right hand column apply, classify the material "low" on that particular dimension.

EXPERIENTIAL *	
special terminology	common vocabulary
provides vicarious experience	provides direct experience
requires special training to use	no special training required
advanced/difficulty reading level	simple/beginning reading level
advanced in nature	introductory in nature
representative of reality	original or actual thing
examples and illustrations are complex and difficult to understand	examples and illustrations are simple and understandable

INTELLECTUAL *	
concept oriented	fact oriented
abstract	concrete
intentions implicit	intentions explicit
criteria implicit	criteria explicit
complex organization	simple organization
evokes analysis type thought	evokes recognition
evokes synthesis type thought	evokes isolated type thought
evokes evaluative type thought	evokes recall

* MOTIVATION	
attractive	plain
stimulating	calming
evocative	routine
examples provocative	examples lacking or not provocative
marked contrast	contrast not evident
compelling	bland
unique	ordinary
complex	simple or uniform
immediate feedback	feedback not available
activity oriented	passivity oriented

EMOTIONAL-PERSONALITY	
ambiguous change oriented ego involving or reflects positive sense of self-esteem reflects appropriate expression of emotion decisions controlled by the learner requires students to make decisions and abide by the con- sequences	set and unequivocal stasis oriented non-ego involving or reflects negative sense of self-esteem reflects inappropriate expression of emotion decisions controlled by others or by chance does not require students to make decisions and/ or abide by the con- sequences

* CREATIVE	
evokes imagination open-ended versatile alternative responses possible nondirective thought provoking interrogative unusual novel fanciful does not lend itself to being judged right or wrong	evokes imitation closed limited restricted responses required directive recall oriented declarative predictable conventional factual does lend itself to being judged right and wrong

* SOCIAL	
respects individuality reflects positive concern for people who are different reflects sensitivity to people reflects positive concern for people and things non prejudicial fosters interpersonal skills	stereotypical reflects negative concern for people who are different lacks sensitivity to people reflects negative concern for people and things prejudicial no interpersonal skills required

VERBAL EXPRESSION (appropriate) (does not apply)	
requires expanded verbal response requires sequencing requires categorizing requires differentiation of opposites requires discrimination of parts and wholes requires discrimination of singular and plural emphasizes rhythm of language	requires simple yes-no verbal response does not require sequencing does not require categorizing does not require differentiation of opposites does not require discrimination of parts and wholes does not require discrimination of singular and plural forms does not emphasize rhythm of language

AUDITORY PERCEPTION	
(appropriate)	(does not apply)
requires organizing, re-producing, or sequencing of sounds and words	does not require organizing, reproducing, or sequencing or sounds and words
requires identifying audio similarities	does not require identifying audio similarities
auditory directions required	auditory directions not required
identifying specific sounds	does not require identifying specific sounds
requires learning rhymes, songs, and finger plays	does not require learning rhymes, songs, and finger plays

VISUAL PERCEPTION	
(appropriate)	(does not apply)
requires the student to identify visual similarities and differences	does not require the student to identify visual similarities and differences
requires the student to organize, reproduce, and remember a sequence of visual stimuli	does not require the student to organize, reproduce, and remember a sequence of visual stimuli
requires finding a specific object against a crowded visual environment or background	does not require finding a specific object against a visual environment or background
requires the student to differentiate right-left, front-back, near-far, top-bottom, and comparable characteristics of visual stimuli	does not require the student to differentiate right-left, front-back, near-far, top-bottom, and comparable characteristics of visual stimuli

MOTOR PERCEPTION	
(appropriate)	(does not apply)
requires body balance	does not require body balance
requires locomotor activity	does not require locomotor activity
involves body parts	does not involve body parts
requires imitative movements	does not require imitative movements
requires fine motor coordination	does not require fine motor coordination
requires using body parts of one or both sides of the body	does not require using body parts of one or both sides of the body
requires hand and arm movements past the midline of the body while head and body are stationary	does not require hand and arm movements past the midline of the body while head and body are stationary

In classifying the piece of curriculum material according to the verbal expression, auditory perception, visual perception, and motor perception dimensions, the classifier must study the materials carefully (including the directions about how it should be used), read the list of characteristics under each dimension, and ask the question:

Which list of terms is most
characteristic of this piece of
curriculum material?

If most or some of the terms in the left hand column for that particular dimension apply, classify the material as "appropriate." If most of the terms in the right hand column apply, or if none of the terms apply, classify the material "does not apply".